

科目：普通物理 適用：電機系二

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. (15%) A ball is thrown vertically upward from the ground with a speed of 80 ft/sec. (a) How long does it take to reach its highest point? (b) How high does the ball rise? (c) At what times will the ball be 96 ft above the ground? (the acceleration due to gravity is approximately 32 ft/sec²)
2. (20%) A 5-kg particle with a velocity of 3.0 m/sec collides with a 10-kg particle that has a velocity of 2.0 m/sec in the same direction. After the collision, the 10-kg particle is observed to be traveling the original direction with a speed of 4.0 m/sec. (a) What is the velocity of the 5-kg particle immediately after the collision? (b) By how much does the total kinetic energy of the system of two particles change because of the collision?
3. (20%) Figure 1 shows three charges q_1 , q_2 , and q_3 . What force acts on q_1 ? Assume that $q_1 = -1.0 \times 10^{-6}$ coul, $q_2 = +3.0 \times 10^{-6}$ coul, $q_3 = -2.0 \times 10^{-6}$ coul, $r_{12} = 15$ cm, $r_{13} = 10$ cm, and $\theta = 30^\circ$. ($1/4\pi\epsilon_0 = 9.0 \times 10^9$ nt-m²/coul²)

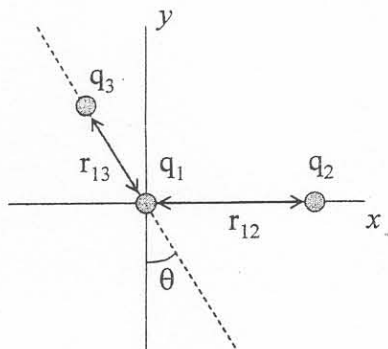


Figure 1

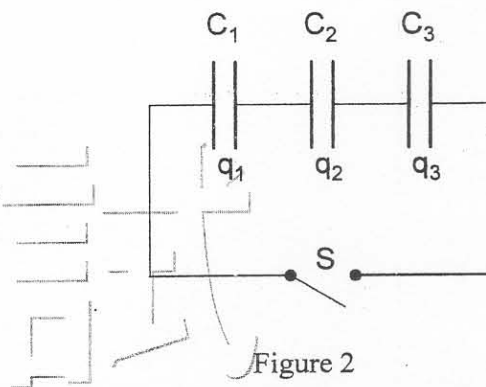


Figure 2

4. (15%) Three capacitors C_1 , C_2 , C_3 , arranged in series as shown in Figure 2, have initial charges q_1 , q_2 , q_3 , respectively. Switch S is then closed. What are the final charges q_1' , q_2' , and q_3' on the capacitors?
5. (15%) An aluminum wire whose diameter is 0.1 inch is soldered end to end to a copper wire a diameter of 0.064 inch. The composite wire carries a steady current of 10 ampere. (a) What is the current density in each wire (please ignore the junction)? (b) What is the drift speed v_d of electron for the copper wire? Assume that there is one free electron per atom in copper and the number of atoms per unit volume in copper is 8.4×10^{22} electrons/cm³.
6. (15%) Please write the Maxwell's Equations and briefly describe them.